



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/801,930	03/16/2004	Severine Catreux	16136US02	4709

7590 02/20/2008  
Christopher C. Winslade  
McAndrews, Held & Malloy  
Suite 3400  
500 W. Madison Street  
Chicago, IL 60661

EXAMINER
----------

VLAHOS, SOPHIA

ART UNIT	PAPER NUMBER
----------	--------------

2611

MAIL DATE	DELIVERY MODE
-----------	---------------

02/20/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.



## Office Action Summary

Application No.

10/801,930

Applicant(s)

CATREUX ET AL.

Examiner

SOPHIA VLAHOS

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 7-13, 19-24, 33-39, 41-42, 44 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-13, 19-24, 33-39, 41, 42 and 44 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |



## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments with respect to the rejection(s) of independent claim(s) 7, 19, 33, 37 under 35 U.S.C. 102(b) as being anticipated by Rayleigh et. al., (U.S. 5,809,422) have been considered but are moot in view of the new ground(s) of rejection.

### *Drawings*

2. New drawing (Fig. 1) was received on 11/14/2007 and is acceptable. The drawings are objected to because Figures 1A-1B should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings (Fig. 2A, 2B) are objected to because these drawings show blocks 218<sub>N</sub> and 268<sub>N</sub> (signal splitters) with the same symbol/block used to designate blocks 230<sub>N</sub> and 276<sub>N</sub> (signal combiners  $\Sigma$ ). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to



avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

4. Claim 39 objected to because of the following informalities: Claim 39 depends on claim 37 but based on its limitations "...said first plurality of divided RF signals..." it depends on claim 38.

### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.



6. Claims 10, 22, 36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10, recites: "further including weighting and combining .... Said first plurality of demultiplexed signals prior to upconverting." where it is understood that the weighting and combination of the first plurality of signals, results into a combined (one) signal, prior to upconversion. This contradicts claim 1, where it is claimed that "said first plurality of demultiplexed signals is upconverted into a first plurality of upconverted signals"

Claims 22, 36 are also rejected for similar reasons, as claim 10 above, since they contain similar limitations.

### ***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 37-39 are rejected under 35 U.S.C. 102(b) as being anticipated by Schiemenz et. al., (U.S. 5,834,972).



With respect to claim 37, Schiemenz et. al., disclose: an upconverter operative to upconvert an input signal into an input RF signal (Fig. 6, see one of the RF modulators 106, shown in detail in Fig. 7, the input signal is the I and Q components of  $A_1$  signal and see up-conversion to  $\omega_0$  frequency, column 3, lines 65-67, ) ; and an RF processing network ( see Fig. 6, RF processing network comprises Amplifier array 104 and transform matrix 102) operative to perform a weighting operation in the RF domain upon said input RF signal (see column 3, lines 27-35, gain/phase weighting performed by amplifier, and/or column 3, lines 12-16 the transform matrix weighting described in the background section) and thereby produce a first plurality of RF signals capable of being transmitted by an antenna structure (see column 3, lines 35-50, output signals 132 are RF signals capable of being transmitted by an antenna structure, see the mentioned wireless standards CDMA, TDMA, GSM).

With respect to claim 38, Schiemenz et. al., further disclose: wherein said RF processing network includes an arrangement of dividing elements capable of dividing said input RF signal into a first plurality of divided RF signals (Fig. 6, transform matrix 102, internal components of, see Fig. 4 4x4 matrix and Fig 2-3, (see background of the invention) where signal A is split into a first plurality of divided RF signals these are the signals out of the top-left block 30 Fig. 4).



With respect to claim 39, Schiemenz et. al., further disclose: wherein said RF processing network further includes an arrangement of weighting elements capable of weighting said first plurality of divided RF signals so as to form said plurality of RF signals (see column 1, lines 50-54 where signal A is weighted in a 2x2 matrix, and see Fig. 4 where the 2 blocks to the right side perform weighting on said first plurality of divided RF signals).

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 7-9, 11, 13, 19-21, 23, 44, 33-35, 41, 37-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foschini et. al., (U.S. 6,888,809) in view of Wallace et. al., (U.S. 7,024,166).

With respect to claims 7-9, 11, 13 Foschini et. al., disclose: demultiplexing an input signal into a first plurality of demultiplexed signals (Fig. 1, see demux 101 outputs); dividing said first plurality of signals into a second plurality of divided signals (Fig. 1 inside each 103-1 unit, splitting of the input signal S1, SN into a second plurality of divided signals (the ones to be multiplied with weights)); weighting said second plurality of divided signals so as to form a second plurality



of weighted signals (Fig. 1 see signals out of blocks 109<sub>N</sub>); combining ones of said second plurality of weighted signals in order to form a third plurality of combined signals (Fig. 1 signals out of combiners 111-N); and transmitting said third plurality of combined signals (see DAC, up-converter, antenna of each 103-N unit, ).

The difference between Foschini et. al., and claim 7 is that Foschini et. al., do not teach: upconverting said first plurality of demultiplexed signals into a first plurality of upconverted signals (and the subsequent weighting and combining does not take place in an upconverted signal domain).

In the same field of endeavor, Wallace et. al., disclose: weighting and combining in an up-converted domain (see Fig. 6, weighting and combining performed by block 610, matrix distribution unit, and column 15, lines 4-10 where it is performed in analog IF or analog RF domain).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Foschini et. al., based on Wallace et. al., so as to match the RF signal with the antenna and reduce signal reflections.

With respect to claim 12, Foschini et. al., further teaches: wherein said plurality of demultiplexed signals are less than said third plurality of antennas (column 1, lines 35-38, column 3 lines 36-46, less (Y) demultiplexed signals are used compared to N antennas).



Method claims 19-21, 23-24 are rejected based on a rationale similar to the one used to reject apparatus claims 7-9, 11-12.

Claims 33-35 are rejected based on a rationale similar to the one used to reject claims 7-9 above (where the first, second, and third plurality of signals of claims 33-35 correspond to the first, third and second plurality of signals of claims 7-9 above).

With respect to claim 41, Foschini et. al., further disclose: wherein values of said weighting elements are selected to obtain the most performance of a receiver disposed to receive said second plurality of RF signals (see column 1, lines 19-21 where transmitted MIMO signals are supposed to be uncorrelated, column 25-43, where the ability of the receiver to extract the transmitted signals is optimized, ie. the receiver processes the weighted signals as if these signals were received uncorrelated) and this is understood to maximize and output signal-to-noise (of the receiver) since SNR is a measure of signal quality at a receiver.

Claims 42, 44 are rejected based on a similar rationale

11. Claims 10, 22, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foschini et. al., (U.S. 6,888,809) in view of Wallace et. al., (U.S. 7,024,166) and further in view of da Silveira et. al., (U.S. 7,248,656).



With respect to claims 10, 22, 36, the system obtained by Foschini et. al., and Wallace et. al., does not: further include weighting and combining, in the baseband domain, said first plurality of demultiplexed signals prior to upconverting.

In the same field of endeavor, da Silveira et. al., disclose: weighting and combining, in the baseband domain, of a plurality of demultiplexed signals prior to upconverting (see Fig. 6, the digital hybrid matrix, see the weighing and combining of the demultiplexed signals, baseband signals since upconversion takes place in block 124, column 8, lines 31-54).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Foschini et. al., and Wallace et. al based on the teachings of da Silveira et. al., to optimize the SNR of sector signals (see column 3, lines 27-31).

Claims 22,36 are rejected based on a similar rationale as claim 10 above.

12. Claim 37 rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Sugar et. al., (U.S. 6,993,299).

With respect to claim 37, Sugar et. al., disclose: an upconverter operative to upconvert an input signal into an input RF signal (Fig. 1, upconverter comprises 140(1-140(N) upconverters up converting signal  $S(f)$  ) and an RF



processing network ( Fig. 1 corresponding plurality N of PA performing weighting operations, column 3, lines 20-25) operative to perform a weighting operation in the RF domain upon said input RF signal and thereby produce a first plurality of RF signals capable of being transmitted by an antenna structure (Fig. 1 antenna structure comprising antennas 120(1)-120(N)).

**Contact Information**

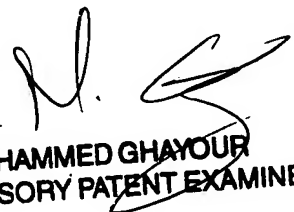
Any inquiry concerning this communication or earlier communications from the examiner should be directed to SOPHIA VLAHOS whose telephone number is 571 272 5507. The examiner can normally be reached on MTWRF 8:30-17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammed Ghayour can be reached on 571 272 3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SV  
2/5/08

  
**MOHAMMED GHAYOUR**  
**SUPERVISORY PATENT EXAMINER**